



Front Porch Center for Innovation and Wellbeing x Bear Robotics Final Report | August 2022





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ACKNOWLEDGEMENTS

FPCIW would like to thank the staff and residents of Casa de Mañana and San Francisco Towers for participating in and contributing to this project. We would like to thank all of the field operators of Bear Robotics that met us at each community to help us with deployment and training. We would also like to thank Cathy Zyetz, an FPCIW intern, who contributed to the data analysis that went into this report.



I. Executive Summary

The COVID pandemic has created unprecedented challenges for the senior living workforce. From staffing shortages to determining the best way to support the well-being and satisfaction of this critical group of frontline heroes, workforce has been a primary focus for all organizations, including Front Porch. One service area that has been especially hard hit during the pandemic is dining services. FPCIW sought to explore how dining robot technologies could potentially support and enhance dining operations while improving the experience for both staff and residents. In partnership with Bear Robotics, FPCIW deployed robots at two Front Porch communities to assess the impact of “Servi” on dining services during a three-month pilot.

Important to FPCIW’s design of the pilot was the integration of adoption and engagement strategies. We believe that clear messaging, active involvement and engagement with community staff and residents, formal kick-off events, and continued trainings played important roles in the outcome of the project.

Overall, the pilot resulted in positive impacts for both staff and residents of San Francisco Towers (SFT) and Casa de Mañana (CDM), our two communities that tested the robots. We found significant increases of residents who “agreed” or “strongly agreed” that the robots positively impacted their dining experiences from pre-pilot to post-pilot:

- 65.4% of residents believed that the robots improved their overall dining experience (+35.8 points from baseline).
- Over half (51.2%) of residents felt that the robots allowed the staff servers to spend more quality time with the diners (+32.3 increase).

The pilot also revealed higher satisfaction and efficiency levels among staff:

- 51.3% of servers “agreed” or “strongly agreed” that they were excited about the robots by the end of the pilot, an increase from 40.0%.
- 58.0% of servers said that the robots allowed them to spend more quality time with residents, up from 48.0% before the pilot.
- An average of 428 fewer steps per dining server after the introduction of robots.

58.0% of servers said that the robots allowed them to spend more quality time with residents.



In our focus group interviews the overwhelming majority of the feedback from residents and staff at both test communities were very positive. Benefits noted included:

- Improved employee and resident satisfaction
- Faster service
- More manageable workload for dining staff
- Helpful to servers
- More time for staff/resident engagement
- Improved employee safety and wellbeing
- Improved operational workflow and efficiencies
- Market distinction
- More fun and excitement and morale boost
- Reduced Overtime
- Boost to recruitment and retention efforts

At the end of the pilot, community members believed that the robots provided effective support and enhanced the dining experience. Here are a few notable comments:

- Residents:
- *Servers are more present, more available.*
 - *I noticed there's a lot more sharing amongst the tables – due to the robot getting to a certain section quicker.*
- Server:
- *Before robots, the expo line was CRAZY and backed up and now it's not so for that reason alone, it's been very helpful.*
 - *The heavy trays were not good for my arms, but now I use the robot.*
- Dining Manager:
- *Our overtime went from \$13,800 down to \$7145 from June to July. We are seeing a declining trend in our OT [because of the robots].*

“Our overtime went from \$13,800 down to \$7145 from June to July. We are seeing a declining trend in our OT [because of the robots].”

–Dining Manager

This report outlines findings from FPCIW’s pilot study with Bear Robotics ‘Servi’ dining robots that point to consistently positive results from residents, staff, and management on the important role that robots have in supporting dining services in senior living communities.



II. Overview of Findings

Following is a brief summary of aggregated survey data collected from both residents and servers at two Front Porch communities before and after our pilot to test Bear Robotics' dining robots. Resident reception towards the robots significantly increased among those who "agreed" or "strongly agreed" that the robots positively impacted their dining experiences from pre-pilot to post-pilot:

- 65.4% of residents believed that the robots improved their overall dining experience (+35.8 points from baseline).
- Over half (51.2%) of residents felt that the robots allowed the staff servers to spend more quality time with the diners (+32.3 increase).

Table 1: Front Porch Total RESIDENTS

	Agree or Strongly Agree (Pre-pilot; n=54)	%	Agree or Strongly Agree (Post-pilot; n=105)	%	Difference
I believe the Servi robot will impact the pace of my dining experience	16	30.2%	67	63.5%	33.3
Overall, I believe the Servi robot will improve my dining experience	16	29.5%	69	65.4%	35.8
Using the Servi robot to assist with serving will allow my server to spend more quality time with me	10	19.0%	54	51.2%	32.3

The Bear Robotics pilot also revealed higher satisfaction levels among dining servers working alongside the Servi robots. We found that the percentage of staff who said that they "Agree" or "Strongly Agree" increased across all measures:

- 51.3% of servers felt excited about the robots, an increase from 40.0%.
- 58.0% of servers said that the robots allowed them to spend more quality time with residents, up from 48.0% before the pilot.



Table 2: Front Porch Total STAFF

	Agree or Strongly Agree (Pre-pilot; n=25)	%	Agree or Strongly Agree (Post-pilot; n=18)	%	Difference
I'm excited about the Servi robot.	10	40.0%	9	51.3%	11.3
The robot will make/makes me more satisfied with my job.	8	32.0%	8	46.1%	14.1
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	12	48.0%	10	58.0%	10.0
I believe that the robot will make/makes the dining experience more fun.	11	44.0%	10	53.4%	9.4

The data analysis reflects positive outcomes not only across all aggregated measures, but also at each of the two community levels. However, the impact levels of the Servi robots were different at Casa de Mañana and San Francisco Towers, and warranted separate community discussions of the pilot in this report.

III. Introduction

Senior living communities experienced some of its worst staffing shortages throughout the COVID pandemic. The need for employees has impacted every aspect of operations, including dining services. As a service-oriented field, senior living has been facing a heightened need to address staff efficiencies and deliver better dining experiences for employees and residents.

According to the [U.S. Administration for Community Living and the Census](#), 98 million U.S. residents are going to be age 65 and older by 2060. By 2034, older adults will outnumber children for the first time in U.S. history. With this rising number of older adults and the decreasing number of younger people to help take on caregiving roles, technology and innovation will be critical to bridging that gap.

In the U.S., more than 90% of senior living providers are facing staffing shortages. A [report](#) by Emsi Burning Glass on bridging the labor gap states, “the upshot is that automation can help fill some of the roles in understaffed industries, and businesses should consider automation as a valuable tool for meeting specific needs.” According to a May 2022 [study](#) from the University of Wisconsin on integrating robotic assistance in senior living communities, technology presents opportunities to bridge the shortage we are seeing, especially those tasks that can be automated.

According to these studies, the main contributing factors of the staffing crisis in senior living as a whole include recruitment challenges, turnover, and overall employee satisfaction. The COVID-19 pandemic has been acutely felt in all levels of operations for senior-based services such as [nursing home care](#), environmental services, and life enrichment. According to the Bureau of Labor Statistics [data](#), long term care workforce levels are the lowest they have been in 15 years.



Dining services has been particularly hit hard in senior care. During the height of the pandemic, it was “all hands on deck” as every available staff member was called to help in the delivery of meals to resident’s homes, and it was not uncommon for executive directors to appear at residents’ doorsteps with a hot lunch. As some dining rooms slowly began to reopen coming out of the pandemic, communities discovered a new set of pressures to keep up with the influx of residents and deliver quality dining experiences with overworked and understaffed teams. In response to these pressures, an emerging and nascent trend [using dining robots](#) has been developing in senior care. While still a novelty, dining robot companies are receiving [increased exposure](#) in response to workforce shortage pain points.

FPCIW selected and partnered with Bear Robotics to pilot test their product at Front Porch dining rooms, primarily because of their relative affordability, and willingness to accommodate the unique needs and demands of the senior living market. FPCIW launched the Bear Robotics ‘Servi’ Pilot in June 2022 in Front Porch communities at San Francisco Towers (SFT) and Casa de Mañana (CDM), and designed our pilot based on focus groups and interviews with residents and staff. We also conducted baseline and post surveys to assess perceptions and receptiveness of the technology, well aware that messaging and marketing were critical cultural drivers of success irrespective of the technical value of the product. This report summarizes our 90-day pilot data, information, and experience with Bear Robotics.

IV. Product Overview: Bear Robotics

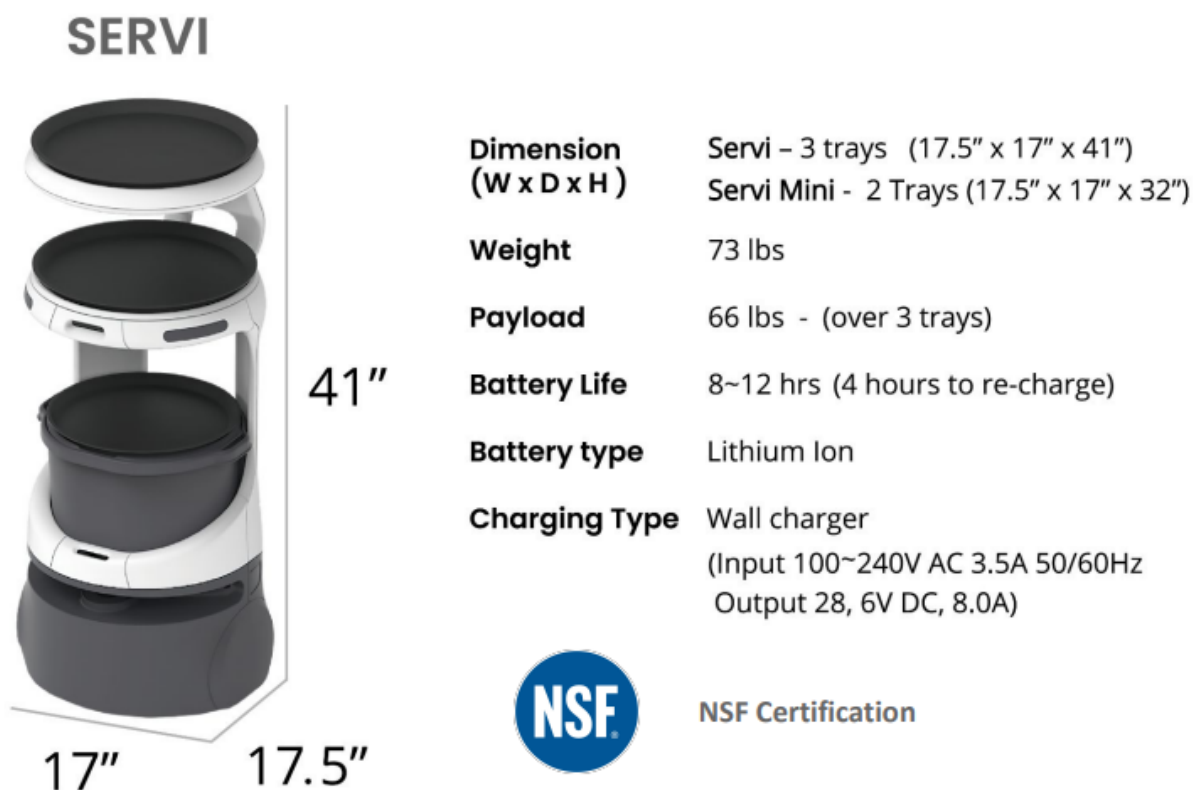
[Bear Robotics](#) is an artificial intelligence robotics company with a mission “to set a new standard in robotics by empowering incredible dining experiences.” Founded in 2017, Bear Robotics addresses the increased pressure faced by the food service industry around wages, labor supply, and cost efficiencies. Their robots are designed to work alongside humans to help address these challenges while simultaneously elevating the customer experience. ‘Servi’ is their first mass-produced robot and can autonomously carry food, drinks, and dirty dishes between the kitchen and tables in a dining facility. Servi is designed to work without additional hardware installation and supports multiple robot operations.

Servi is a 100% self-driving robot that houses attachments such as drink trays, bus tubs, and more to simplify hospitality through technology. Servi capabilities include the following:

- LiDAR sensors and 3 cameras for 100% self-driving navigation
- Auto Return automatically sends Servi back to its post when a job is done
- At 17” wide, Servi navigates nimbly around tight spaces
- Multiple operations for food running, bussing, hosting, patrol and party modes
- Capable of carrying 5-7 entrees depending on plate size
- Adjustable speeds allow for the robot to be custom fitted for each environment
- NSF-certified for required safety and reliability standards
- Multi-Robot mode allows you to run multiple robots in the same space
- Threshold flooring transitions should be 1/4 inch or less for optimum delivery



Image 1. Servi the dining robot and it's specifications



V. Pilot Design

FPCIW deployed our pilot to Front Porch communities San Francisco Towers (SFT) and Casa de Mañana (CDM), and partnered with Bear Robotics to discuss strategies and tactics for community adoption, and developed tools and processes for solution piloting and deployment. FPCIW distributed surveys and collected qualitative data through community interviews and focus groups, and worked closely with the Bear Robotics team to provide trainings, user documents, and other supportive tools specific to and necessary for this pilot (see Appendix). Along with data collection tools, FPCIW conducted an environmental scan of each community which was then combined with the measurements that Bear Robotics took during their scan and the number of robots were determined. Based on the server-to-table ratio, San Francisco Towers had 3 robots and Casa de Mañana received 2 (see section on “Environmental Scan” below for details).

The 60-day pilot set two primary goals to test the Servi dining robot at both of our communities: 1) to provide staff dining service support, and 2) to measure resident satisfaction with the dining robots. Pilot activities included:

- Design of a project plan and framework



- Implementation support
- Data collection and impact analysis via survey distribution and collection
- Resident & staff engagement through focus group discussions
- Staff training
- Kick-off event
- Ongoing sustainability of the innovation
- Drafting of a white paper/final report

Our Bear Robotics pilot outlined the following objectives:

1. Identify and assess a specific area of community needs impacting residents, staff, and operations, specifically in dining operations;
2. Identify and evaluate a technology solution or innovation provided by Bear Robotics that potentially responds to that need;
3. Design and frame a pilot that outlines parameters for testing and evaluation of impact;
4. Identify, recruit, and engage with key staff and resident stakeholders for participation in the project;
5. Develop a messaging and marketing plan to promote community engagement and involvement;
6. Draft a report based on quantitative and qualitative data analysis with recommendations and successful adoption strategies through a white paper; and
7. Develop a replicable model for scalability and sustainability.

There were three main components of this pilot: 1) pre-deployment and assessment, 2) pilot deployment and technology adoption, and 3) post-deployment analysis.

✓ **Pre-deployment and Assessment**

- Conduct a pre-deployment focus group with community staff and residents to assess community dining needs
- Observe dining service operations and flows to establish baseline conditions
- Conduct an environmental needs assessment that includes the identification of physical requirements such as floor thresholds and kitchen and dining entrances/exits
- Collect data through staff and resident surveys and interviews

✓ **Pilot deployment and Technology Adoption**

- Conduct an education and outreach campaign for dining services and residents on the introduction of Servi to the community
- Launch a kick-off event
- Design as-needed and appropriate training for dining services staff members
- Monitor use and data analytics provided by Bear Robotics

✓ **Post-deployment Analysis**

- Schedule and complete focus group interviews and post-pilot surveys
- Publish a white paper with a summary analysis



A. Adoption Strategy

As with any the introduction of any new technology to a Front Porch community, FPCIW put much thought and consideration into our adoption plan for the Servi robots. Our approach was to be intentional about the introduction of the technology in the communities, and to set staff and residents up for success prior to, during, and beyond the pilot period.

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i. Messaging and Marketing

One of the lessons we learned in conversations with Bear Robotics on where they struggled in senior living communities was in clear messaging and communications. Unsurprisingly, Bear's customer clients whose managers did not clearly and appropriately inform their staff of the arrival of robots encountered strong resistance. In the case of events when the Servi robots were deployed without any warning or



news, dining staff were immediately suspicious and perceived the technology as management's efforts to replace its workers with technology. Similarly, residents expressed concerns that the robots were going to take people away from their dining services. These are extreme anecdotal examples of what not to do when deploying a new technology in senior communities, but serve as important cautionary tales throughout the planning and implementation process. During the preparation stages of our pilot, Bear provided each of our community's leadership and dining managers with a helpful overview of their technology, value proposition, and recommendations for community communications about their technology.

In partnership with our community leadership, FPCIW outlined clear and simple talking points in the messaging to staff and residents:

- Our community dining services, like many in the general hospitality field, is experiencing severe labor shortages, and our dining staff are often struggling to provide quality services to our residents.
- We are *testing* dining robots as a way to address some of the challenges of having fewer workers do more repetitive and time-consuming tasks such as delivering food to and from the kitchen.
- Robots will not take away jobs—they're here to *support* our dining staff to provide better service and customer satisfaction. The more satisfied our servers are, the better they'll be able to do their jobs.

These messages were important in setting the stage for the introduction of the robots and allay some of the concerns and negative perceptions of automation technologies.

Throughout the course of the pilot, messaging and marketing have also played an important role in hiring. At San Francisco Towers, the dining manager reported that he started using the Servi robots as a recruiting tool to attract new employees. He has been letting new applicants know that they were going to work alongside robots, and the responses among new applicants have been overwhelmingly positive and enthusiastic because of the novelty factor, and well as a way to increase efficiencies and improve safety from injuries.

ii. Community Engagement

FPCIW placed a high value on community involvement and engagement throughout the pilot. While such efforts often take time, laying the groundwork and creating multiple opportunities to connect with staff and residents about the project produced dividends throughout the course of the project.

As a component of our pre-deployment plans, we met directly with community members. We coordinated with dining managers to set up focus groups and interviews with front line dining workers including servers and food preparers to explain our proposed project, better understand their pain points, listen to their concerns and fears, and invite ways for them to actively participate in the testing. We also set up meetings with resident dining committees to collect data on their experiences and pain points, discuss the opportunity to address their needs, and to promote their involvement to spread the word of the project. The reception was overwhelmingly positive, and residents repeatedly expressed their gratitude in having the opportunity and space for their input.



FPCIW collaborated with our community dining managers to organize a celebratory kick-off at our two communities. Our teams decorated the dining rooms with balloons, and used the Servi robots as pass trays to hand out robot-themed treats. The excitement and buzz during these events were palpable, and the robots were surrounded by curious residents taking pictures to send to their family members and friends of their exciting addition to their dining services. We also placed information flyers about the Servi robots on each of the tables for residents to briefly describe the robot and the pilot project. These community events helped set the positive tone and messaging that were important to sustaining community engagement throughout the pilot.

iii. Environmental Scan

During the pre-pilot phase, FPCIW conducted an environmental needs assessment at both communities that included the identification of physical requirements such as floor thresholds, carpeting, and kitchen and dining entrances/exits. We also observed staff and residents during dining service hours. Bear Robotics conducted their own assessment in which they took down measurements using the Servi robot and mapped out each dining area. With this process, they also used sphere decals on the ground to help guide each robot to a specific area it needed to go.

Our inventory of the physical and operational aspects of the dining room and services included:



- Thresholds and flooring: assessing floor dips, stairs, carpeting, leveling, ridges, ramps, etc.
- Measuring distances between the kitchen and furthest table
- Frequency a server goes back to a single table (on average)
- The number of servers on the floor at any given meal time
- The number of plates a server typically carries
- The weight of plates
- Food and beverages served (more food than drinks? Is there a ratio?)
- High traffic areas, flow in/out of entrance/exit to kitchen
- Bear's own scan/analysis, map of dining areas and tables
- How many residents are served during each meal period?

Though Bear Robotics did not have a formal formula to determine the needed number of robots, they based this recommendation on the number of servers and tables during the busiest dining periods at each community. At Casa de Mañana, Bear suggested 2 robots based on 4 total servers per 24 tables; San Francisco Towers used 3 robots for 11 servers per 53 tables.

One of the key learnings that also came out of the pilot was understanding the importance of workflow. Because it was important to make certain accommodations to increase the robots' efficiencies, the dining managers at both CDM and SFT redesigned their expeditor and plating processes so that they could minimize the time to place meals on the robots' trays. This was an important workflow change that benefited the use of the robots, but it also helped the dining managers re-imagine the way they prepared their meals for their servers (and thus the robots) more quickly.

One of the key learnings that also came out of the pilot was understanding the importance of workflow.

iv. Staff Trainings

To maintain service quality and to ensure safety, our communities used the robot's "server mode," which required that only staff remove plates off of the robot's trays to place the meals in front of the diner. Bear provided the dining servers with trainings before and during the kickoff event, along with a user manual that covered several operational topics:

- How, when, and where to charge the robot
- How to turn the robot on/ off
- How to use the screen to control the robot
- Common problems
- Information about localization (repositioning the robot)



The overall use of the robot is simple. A staff member loads the robot's trays with plates, and presses a button that's been pre-designated to target a specific location. During the training, staff were encouraged to interact directly with the robots and tap the screen in multiple ways to help staff feel comfortable using the robots while technical support was onsite.

A simple troubleshooting guide was also left with each community for quick access to issues that may come up and the support phone number for Bear Robotics was clearly indicated on each page of both guides.



VI. Pilot Findings

A. Casa de Mañana

Casa de Mañana (CDM) is a Front Porch community located in the city of La Jolla, CA. CDM has one main dining room. In June 2022, we started the Bear Robotics pilot with 2 dining robots. While the community did not have to shut down its dining services during the course of the pilot, it did need to make some



changes during a heightened number of COVID cases and severe shortages of staff, transitioning from full-service dining to a buffet service.

CDM also encountered some technical issues that involved error messages and failed deliveries with their robots. We discuss the technical challenges below, and note their impact in our overall findings of the pilot at CDM. Because of their dining service changes due to COVID and the technical problems they encountered, the community’s original 60-day pilot was extended to 90 days. Below are the pre-pilot, intermediary, and post-pilot data analysis of the experiences of both staff and residents at CDM.

RESIDENT FEEDBACK

A short survey was distributed to residents pre- (n=40) and post-pilot (n=41) to assess their perceived impact of the robot (Table 3). Based on responses both at baseline and at the end of the project, we found improvements across all of our measurements of resident perceptions, and that residents overall believed that the Servi robots had a positive impact on their dining experiences.

Table 3: CDM Resident Feedback

	Agree or Strongly Agree (Pre-pilot; n=40)	Agree or Strongly Agree (Post-pilot; n=41)	Difference
I believe the Servi robot will impact the pace of my dining experience	45.00%	52.20%	+7.2
Overall, I believe the Servi robot will improve my dining experience	42.50%	52.20%	+9.7
Using the Servi robot to assist with serving will allow my server to spend more quality time with me	37.50%	50.00%	+12.5

We also saw noticed changes to the number of residents who could potentially impact peer opinions. To the question “Would you recommend the Servi robot to another community,” the percentage of potential influencers (those reporting a “9” or “10”) among residents increased from 12.5% to 19.6%, or 7.1 points. (Table 4)

Table 4. CDM Resident Recommendation (n=40; 41)

	Would you recommend the Servi robot to another community?											Change (9+10)
	Unlikely						Very Likely					
	0	1	2	3	4	5	6	7	8	9	10	
PRE-pilot	10.0%	2.5%	5.0%	5.0%	2.5%	40.0%	5.0%	10.0%	7.5%	0.0%	12.5%	7.1
POST-pilot	2.2%	2.2%	4.4%	10.9%	2.2%	17.4%	13.0%	10.9%	17.4%	2.2%	17.4%	

FPCIW conducted focus group discussion with residents of CDM, and many of the comments echoed our findings. Here were some of the notable questions and comments (see Appendix for full discussion notes):



- How is the speed of service? Is the wait for your food/drinks ever an issue/concern?

Pretty slow; staff-driven.

Much better since they staggered.

Definitely the food showed up quicker the last few months because of the robots.

- How do you feel about the robots supporting dining services?

Much cuter than I thought it was going to be.

The most important thing is how the staff feel; if it makes it harder for them then no, but doesn't bother me in any way.

After a short period of time, it becomes part of the environment.

Originally many naysayers, the chair of committee really pushed for it; the complainers have been won over.

We enjoy them.

STAFF FEEDBACK

A short survey was distributed to staff pre- and post-pilot to assess their excitement about robot use, job satisfaction, quality time with residents, and making the dining experience more fun. Staff perceptions at Casa de Mañana across the four measures positively improved. Notably, the dining servers were more satisfied by 19.8 percentage points. (Table 5)

Table 5: CDM Staff Feedback

	Agree or Strongly Agree (Pre-pilot, n=14)	Agree or Strongly Agree (Post-pilot, n=8)	Difference
I'm excited about the Servi robot.	28.5%	42.4%	+13.9
The robot will make/makes me more satisfied with my job.	21.4%	41.2%	+19.8
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	35.7%	47.1%	+11.4
I believe that the robot will make/ makes the dining experience more fun.	35.7%	47.1%	+11.4

Bear makes available data reporting on the Servi robots. Bear emailed daily reports to FPCIW team members and select leadership at each community, along with access to an on-demand dashboard for data analytics that outlined metrics such as successful/failed deliveries, number of trips, and distances travelled. As depicted in Chart 1 below, the 2 dining robots at CDM made a total of 736 successful deliveries throughout the pilot. Failed deliveries were those that never made it to the designated location, of which there were 188. There was a ~88% mission success rate.



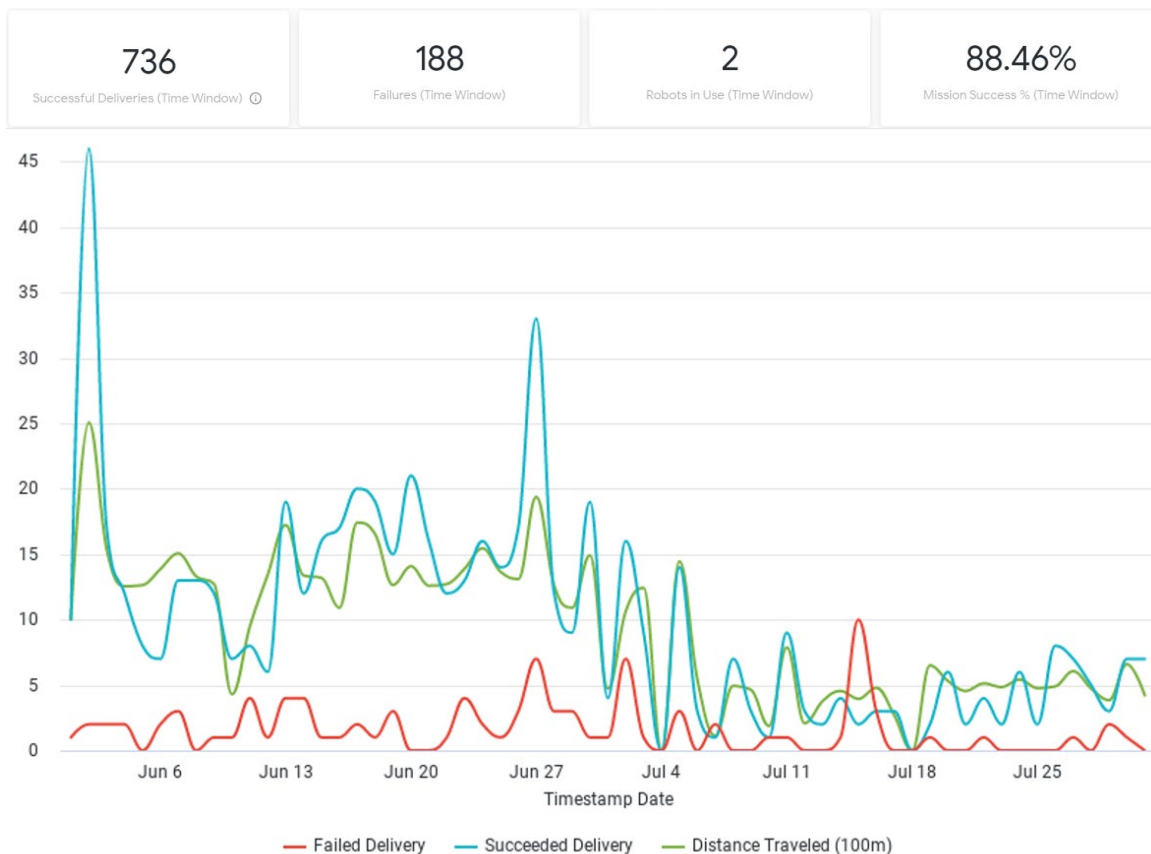
Technical Issues at CDM

During the first weeks of the pilot period, CDM experienced several technical issues. The Bear technicians were generally responsive and available to come on site within 1-3 days during tech support needs, but unfortunately were not always able to sufficiently address the problems until later during the pilot period.

The staff experienced a high number of “mislocalizations”, events that prompted the Servi’s to pause and display an error message when its location didn’t correspond to its mapping system. However, this issue was remedied with additional staff training on how to re-orient the robot, when it would get “lost”.

Robot-to-robot communication problems also stalled the devices and prevented them from proceeding on their paths. The robots would also on occasion stop and “dance”, continuously spinning, much to the frustration of the servers. We later learned that the original placement of the Bear wireless router (which enabled robot-to-robot communications) was too far from the robots’ activities, and so we relocated them to a closer position to the robots’ activities. We also realized that when the staff moved the buffet station, the robots’ path was cut off and needed a mapping update because the robot did not recognize the new environment; the Bear technicians remedied this by re-mapping the new arrangement for the robots.

Chart 1. CDM Data Analytics, Servi Dining Robots usage during pilot period





FPCIW conducted focus group discussion with staff of CDM. Here were some of the notable questions and comments (see Appendix for full discussion notes):

- General thoughts [about the robot]

There are times when it is helpful, but it can be so slow when you're in a hurry

I'm the only one who uses it for breakfast; especially for big tables it's very helpful

At first it was great/ helpful; first courses are great, but when they couldn't talk to each other, it got frustrating

They move slowly; but not TOO much of an issue because I don't want things to spill

It definitely helps to run food out of the kitchen

- If we were to remove these robots today, how would you feel?

It's definitely gotten better so as of right now, I'd be bummed

I'd be bummed too

Before robots, the expo line was CRAZY and backed up and now it's not so for that reason alone it's been very helpful

We'd be screwed

It does help

B. San Francisco Towers

San Francisco Towers (SFT) is a Front Porch community centrally located in the city of San Francisco, CA. SFT offers formal dining in the main dining room and a casual café, and its dining services are managed by [Morrison Living](#)—the pilot at San Francisco Towers was championed by both the executive director and Morrison's dining management team. In June 2022, we launched the Bear Robotics pilot with 3 dining robots in the main dining room for 60 days. Due to a COVID outbreak, SFT was forced to close down its dining rooms and was therefore delayed for a month before the project's launch. Below are the pre-pilot, intermediary, and post-pilot data analysis of the experiences of staff and residents at SFT.

RESIDENT FEEDBACK

SFT resident surveys, like at CDM, reported improved satisfaction on residents' dining robot experiences before and after the pilot, yet their reception to the Servi's were significantly higher. We saw a noticeable shift from respondents who initially answered "Neutral/I don't know" in their answers (62.5% to 75%) to "Agree/Strongly Agree" (see Appendix for detailed table).



Table 6: SFT Resident Feedback

	Agree or Strongly Agree (Pre-pilot; n=14)	Agree or Strongly Agree (Post-pilot; n=64)	Difference
I believe the Servi robot will impact the pace of my dining experience	25.0%	81.2%	+56.2
Overall, I believe the Servi robot will improve my dining experience	25.0%	85.9%	+60.9
Using the Servi robot to assist with serving will allow my server to spend more quality time with me	12.5%	53.2%	+40.7

We believe the differences between the two communities largely had to do with situational and technical differences:

- General delays due to COVID
- Changes in their dining program (table service to buffet-style service)
- Impact on the robot’s performance (due to a mapping issue when a table was misplaced)

Similarly, to the question of whether residents would recommend the dining robots to other senior living communities, we found a dramatic increase in the share of potential influencers (individuals scoring a “9” or a “10”). (Table 7)

Table 7. SFT Resident Recommendation (n=14; 64)

	Would you recommend the Servi robot to another community?											Change (9+10)
	Unlikely						Very Likely					
	0	1	2	3	4	5	6	7	8	9	10	
PRE-pilot	37.5%	12.5%	0.0%	12.5%	0.0%	12.5%	0.0%	0.0%	12.5%	0.0%	12.5%	34.3
POST-pilot	0.0%	1.6%	1.6%	1.6%	0.0%	4.7%	6.3%	9.4%	28.1%	15.6%	31.2%	

FPCIW also conducted focus group discussions with residents of SFT. Here were some of the notable questions and comments from the post-pilot conversation (see Appendix for full discussion notes):

- How is the speed of service? Is the wait for your food/drinks ever an issue/concern?
Generally great; sometimes during real shortage its slower

During the last 2 months (pilot period), feels much faster
- How do you feel about the robots supporting dining services?
Positive; thumbs up all around

Fun and entertaining

One resident said the robots are helping our servers so it’s great because they are aging as we are



We are so fond of our servers; if the servers are happy, we are absolutely thrilled

- What do you appreciate most of the service provided by dining staff?

Servers more present, more available

Dining staff are exceptional; loyal and caring – knows all preferences

Wonderful job; goes the extra mile

Noticed there’s a lot more sharing amongst the tables – due to the robot getting to a certain section quicker

STAFF FEEDBACK

We distributed a short survey to SFT’s servers before and after the pilot. The percentage point differences were again positive in each of the metrics, but not nearly as high as the scores we found at CDM. We believe that this was due to the fact that at baseline, the server staff at SFT in general were already more enthusiastic and eager to test the Servi robots.

Table 8: SFT Staff Feedback

	Agree or Strongly Agree (Pre-pilot; n=11)	Agree or Strongly Agree (Post-pilot; n=10)	Difference
I’m excited about the Servi robot.	54.6%	58.4%	+3.8
The robot will make/makes me more satisfied with my job.	45.5%	50.0%	+4.5
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	63.7%	66.7%	+3.0
I believe that the robot will make/ makes the dining experience more fun.	54.6%	58.4%	+3.8

FPCIW’s focus group discussions with **staff** at SFT were overall positive. Here were some of the notable questions and comments from the post-pilot conversation (see appendix for full discussion notes):

- What are your general thoughts about them?

Positive

Thumbs up

I don’t have to walk as much back and forth

We want a bigger robot



It is very helpful

I don't have to use my shoulder and I'm pain free

The heavy trays were not good for my arms, but now I use the robot

We have more time w/ the residents

- If we were to remove these robots today, how would you feel?

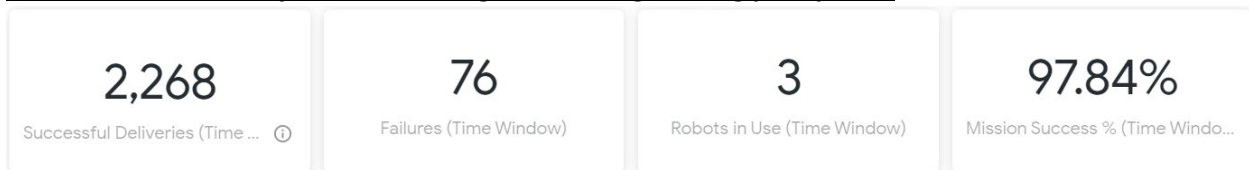
Sad

Mad

No, no definitely no

It has been very helpful for us and we want to use it mor

Chart 2. SFT Data Analytics, Servi Dining Robots usage during pilot period



During the pilot period, daily reports were emailed out to FPCIW leads and select leadership at each community along with access to a dashboard for data analytics. As depicted in Chart 2 above, the 3 dining robots at SFT made a total of 2,268 successful deliveries. Failed deliveries were those that never made it to the designated location, of which there were only 76. There was a ~98% mission success rate, which we believe was higher than at CDM because SFT did not encounter as many technical issues.

In a follow up interview with the dining manager at SFT, we asked him to elaborate on a comment he made about cost savings. He shared that his “overtime [costs] went from \$13,800 down to \$7145 from June to July. We are seeing a declining trend in our OT. In the past we would have asked a staff member to come back for a split shift after working the morning shift. Now we run with the labor we got with the support of the robots.” While addressing staff cost efficiencies was not the focus of this study, the impact of robots on labor savings in dining services deserves further research and attention.



C. Pedometer readings

During our initial focus group meetings with dining servers, one of the responses we heard from staff at both of our communities was that they were making a high number of trips to and from the kitchen. The time they spent going back and forth was particularly stressful during the pandemic because of the fewer number of employees available, and they also felt that their quality of time spent with residents and of providing service were compromised.



Table 8. Average steps/server

	Pre-pilot	Post-pilot	Difference	% change
CDM (n=31; 12)	6682.9	6097.0	-585.9	-8.8
SFT (n=35; 35)	5117.1	4847.2	-269.9	-5.3

The server pedometer readings reported an overall decrease in the average number of steps a server took during the pilot period at the two communities (see Table 8 above). While SFT saw a 5.3 percentage point drop in steps, the higher point-change drop of 8.8 at CDM may have been due to the fact that the dining set up was moved to a buffet-style arrangement, which was when their steps were recorded. But while both of these results may not point to significant step savings advantage, we are hypothesizing that the servers are actually spending more time on the floor in direct service to residents, and we believe that our data bears this out based on resident and staff satisfaction measures from surveys and focus group discussions (e.g., spending more quality service time with residents at their tables).

D. Recommendations and Pro-tips

As we move forward in developing a diffusion program to continue to introduce dining robots to our other Front Porch communities, FPCIW will replicate the adoption strategies, technical support protocols, educational programs, and staff engagement approaches we discovered during the pilot that we believe have proven successful at SFT and CDM. A successful pilot does not come without a few challenges and recommendations for future rollouts.

For senior living providers interested in working with dining robots such as with Bear Robotics and their Servi product, FPCIW outlines below a checklist of some key recommendations for success:

- Both the community and technology partner should understand the technical/ network requirements of the robots up front to determine connectivity needs.
- Clearly communicate and confirm notification and scheduling of onsite visits and trainings prior to day of deployment (this was particularly important during COVID visitation restrictions).
- Be prepared with clear deployment and kick-off plans and agendas.
- Review and prepare marketing collateral both for residents and staff (i.e., flyers, postcards, etc.) that you feel appropriate for your community, and ensure that these be designed with older adult users in-mind.
- Workflow management documentation (e.g., when to charge, when and how to clean, etc.)
- Day-of onboarding for staff:
 - Staff training agenda (set aside sufficient time for both the social and technical aspects of robot).
 - Brief and sufficient training material, including a user manual and basic troubleshooting guide.
 - Talking points for staff to communicate to residents.
- Planning for fun materials for kick-off events w/ residents (i.e., stickers, treats, swag, etc.)



VI. Conclusion

The pilot with Bear Robotics has demonstrated a positive impact at Casa de Mañana and San Francisco Towers. We found increases in both resident and staff satisfaction across all measures, and learned that the technology is now a mainstay of the dining services at these communities that have also led to increased efficiencies and a higher quality level of dining services.

Efforts to sustain and continue the use of the dining robots at each respective community beyond the pilot have been supported by both staff and residents. During the course of the pilot, both staff and residents recognized the robot's benefits and positive impact during dining periods. San Francisco Towers and Morrison were highly encouraged with their pilot, and had committed to a 3-year lease of the Servi robots. Similarly, Casa de Mañana has committed to a purchase arrangement to keep their 2 Servi's with a 3-year service contract. Front Porch is now exploring the diffusion of the project to other Front Porch dining services.

As Bear Robotics and other robotic technologies continue to grow and expand their presence in the marketplace, FPCIW believes that increased opportunities will emerge for staff at senior living communities to take advantage of automated technologies. The success of the Bear Robotics pilot was predicated on the partnership and combined efforts of FPCIW, the SFT and CDM management and staff, community resident food & beverage committees, and general resident community. While some of the critical engagement efforts necessary to sustain and grow the project occurred organically, these developments were only possible through a combination of intentional adoption strategies, program design, and staff/resident involvement.



VII. Appendix

DETAILED DATA TABLES: CASA DE MANANA

Table 9 & 10. Pre- and Post-pilot Survey Data: CDM STAFF (n=22)

PRE-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
I'm excited about the Servi robot.	14.30%	7.10%	50.00%	21.40%	7.10%
The robot will make/makes me more satisfied with my job.	7.10%	7.10%	64.30%	21.40%	0.00%
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	14.30%	14.30%	35.70%	14.30%	21.40%
I believe that the robot will make/ makes the dining experience more fun.	7.10%	0.00%	57.10%	28.60%	7.10%

POST-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
I'm excited about the Servi robot.	5.90%	5.90%	52.90%	35.30%	7.10%
The robot will make/makes me more satisfied with my job.	0.00%	17.70%	41.20%	41.20%	0.00%
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	0.00%	23.50%	29.40%	35.30%	11.80%
I believe that the robot will make/ makes the dining experience more fun.	0.00%	5.90%	47.1	47.10%	0.00%



Table 11 & 12. Pre- and Post-pilot Survey Data: CDM RESIDENT (n=81)

PRE-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
Impact on pace	0.00%	0.00%	55.00%	17.50%	27.50%
Will improve my overall experience	2.50%	2.50%	52.50%	22.50%	20.00%
Server will spend more quality time with me	0.00%	0.00%	62.50%	17.50%	20.00%

POST-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
Impact on pace	0.00%	8.70%	39.10%	32.60%	19.60%
Improved my overall experience	0.00%	8.70%	39.10%	26.10%	26.10%
Server spends more quality time with me	2.10%	13.00%	34.80%	30.40%	19.60%

DETAILED DATA TABLES: SAN FRANCISCO TOWERS

Table 13 & 14. Pre- and Post-pilot Survey Data: SFT STAFF (n=21)

PRE-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
I'm excited about the Servi robot.	0.00%	0.00%	45.50%	9.10%	45.50%
The robot will make/makes me more satisfied with my job.	0.00%	0.00%	54.60%	9.10%	36.40%
Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	0.00%	0.00%	36.40%	36.40%	27.30%
I believe that the robot will make/ makes the dining experience more fun.	0.00%	9.10%	36.40%	36.40%	18.20%

POST-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
I'm excited about the Servi robot.	0.00%	0.00%	41.70%	16.70%	41.70%
The robot will make/makes me more satisfied with my job.	0.00%	0.00%	50.00%	16.70%	33.30%



Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.	0.00%	0.00%	33.30%	41.70%	25.00%
I believe that the robot will make/ makes the dining experience more fun.	0.00%	8.30%	33.30%	41.70%	16.70%

Table 15 & 16. Pre- and Post-pilot Survey Data: SFT RESIDENT (n=78)

PRE-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
Impact on pace	0.00%	0.00%	75.00%	12.50%	12.50%
Will improve my overall experience	12.50%	0.00%	62.50%	25.00%	0.00%
Server will spend more quality time with me	12.50%	12.50%	62.50%	12.50%	0.00%

POST-pilot survey results	Strongly Disagree	Disagree	Neutral/ I don't know	Agree	Strongly Agree
Impact on pace	1.60%	0.00%	17.20%	65.60%	15.60%
Improved my overall experience	1.60%	0.00%	12.50%	70.30%	15.60%
Server spends more quality time with me	1.60%	9.40%	35.90%	39.10%	14.10%



Survey 1. Resident Survey

RESIDENT Dining Robot Experience Survey

The Front Porch Center for Innovation and Wellbeing is conducting a pilot test of the Servi Robot by Bear Robotics. The goal of this pilot is to learn how to utilize a robot in dining services to enable us to provide you with better service; and to also support the needs of our dining services staff. We are conducting anonymous pre-pilot, intermediary, and post-pilot surveys about the impact of Servi on your dining experience. **Please circle your answers below.** When complete, please place in the box [LOCATION] on your way out. Thank you! (To take this survey online: <https://www.surveymonkey.com/r/CVL575J>)

1. I believe the Servi robot will/did impact the pace of my dining service.

Strongly Disagree		Neutral/I don't know		Strongly Agree
1	2	3	4	5

2. Overall, I believe the Servi robot will/did improve my dining experience.

Strongly Disagree		Neutral/I don't know		Strongly Agree
1	2	3	4	5

3. Using the Servi robot to assist with serving will allow/allowed my server to spend more quality time with me.

Strongly Disagree		Neutral/I don't know		Strongly Agree
1	2	3	4	5

4. On a scale of 0-10, how likely would you recommend the Servi robot to another community?

Unlikely										Very Likely
0	1	2	3	4	5	6	7	8	9	10

5. Do you have any other comments for us?



Survey 2. Staff Survey

STAFF Dining Robot Experience Survey

The Front Porch Center for Innovation and Wellbeing is conducting a pilot test of the Servi Robot by Bear Robotics. The goal of this pilot is to learn how to utilize a robot in dining services to enable us to provide residents with better service, and to support the needs of our dining services staff. We are conducting anonymous pre-pilot, intermediary, and post-pilot surveys about the impact of Servi on dining services. **Please circle your answers below.** When complete, please fold it in half and place it in the envelope located at [LOCATION]. The results of this survey will be kept confidential. Your honesty and constructive input are greatly appreciated! (To take this survey online: <https://www.surveymonkey.com/r/YX6TFT8>)

1. I'm excited about the Servi robot.

Disagree		Neutral/I don't know		Agree
1	2	3	4	5

2. The robot will make/makes me more satisfied with my job.

Disagree		Neutral/I don't know		Agree
1	2	3	4	5

3. Using the Servi robot to assist with serving will allow/allowed me to spend more quality time with residents.

Disagree		Neutral/I don't know		Agree
1	2	3	4	5

4. I believe that the robot will make/ makes the dining experience more fun.

Disagree		Neutral/I don't know		Agree
1	2	3	4	5

5. Do you have any other comments for us?



Notes 1. SFT Post-pilot Focus Group Discussion Notes – Staff and Residents

Bear Robotics/ FPCIW

Post- Deployment Focus Group Notes (SFT)

Staff

[Thinking about the last 2 months...]

- Describe for a few minutes your typical work shift
- What is the most enjoyable part about your job?
- What is most difficult about your job, your top concerns?

[Specifically, about the robots...]

- What are your general thoughts about them?
 - Positive
 - Thumbs up
 - I don't have to walk as much back and forth
 - We want a bigger robot
 - It is very helpful
 - I don't have to use my shoulder and I'm pain free
 - The heavy trays were not good for my arms, but now I use the robot
 - We have more time w/ the residents
 - We spend more time w/ the residents
- Do you have any worries or concerns about the robots currently?
 - Food has spilled before where the carpet is bumpy
 - Sometimes the top moves because it is wider w/ trays
 - One robot gets lost sometimes
- How do you think the residents are reacting?
 - They like it; they're always asking about it
 - Most of them really like it; they have fun with it
 - One resident doesn't love it; he thought it was going to replace the staff
- *What are some creative ways you envision using Servi outside of the dining hall?*
- If there was something more the robots could do (a new/ different feature), what would it be?
 - Clean the table (joke)
 - We need to incorporate bussing the tables/ let dishwasher know
 - I wish the robots were bigger so I can fit an entire table's worth of food without worrying about it tipping over
- Any specific feedback to the team at Bear?
 - More weight in the bottom would be good; would make it feel more stable
 - There was one time the robot got very close to a resident that was walking very slowly' should have a sound
- Do you recommend these robots to other Front Porch communities?
 - Yes, especially if it's a large dining room
 - It's very helpful
- If we were to remove these robots today, how would you feel?



- Sad
 - Mad
 - No, no definitely no
 - It has been very helpful for us and we want to use it more
 - Misc.
 - Robots are a “cool factor” – Jamie uses it during interviews/ hiring
 - From a financial prospective, OT is saved (robots provide more flexibility) – went from ~5% to ~1% since pilot. Our overtime went from \$13,800 down to \$7145 from June to July. We are seeing a declining trend in our OT. In the past we would have asked a staff member to come back for a split shift after working the morning shift. Now we run with the labor we got with the support of the robots.
-

Residents

[Thinking about the last 2 months...]

- How often did you dine in the dining room at SFT?
 - Every day (at least one meal a day)
 - 4/5 times a week
- What do you appreciate most of the service provided by dining staff?
 - Servers are more present, more available
 - Dining staff are exceptional; loyal and caring – knows all preferences (hot preferences)
 - Wonderful job; goes the extra mile
 - Works well as a team; reflection of the top and Jamie’s leadership
 - Does well with substitutes; goes beyond what they need to do
 - Noticed there’s a lot more sharing amongst the tables – due to the robot getting to a certain section quicker
- What is your favorite part about the dining experience at SFT?
 - Socialization between residents; between staff and residents
 - Exceptionally good for the price we pay for
- How is the speed of service? Is the wait for your food/drinks ever an issue/concern?
 - Generally great; sometimes during real shortage its slower
 - During the last 2 months, feels much faster
 - The servers worried at the beginning that maybe they might go to the tables TOO much

[Specific to the robot...]

- How do you feel about the robots supporting dining services?
 - Positive; thumbs up all around
 - Fun and entertaining
 - Overall positive all around
 - One resident said the robots are helping our servers so it’s great because they are aging as we are
 - Sometimes one robot gets lost (known issue, referred to Bear)
 - Residents asked servers; everyone said they were comfortable
- Do you have any worries/ concerns regarding the dining robots currently?



- Will empty dining roles be a priority to fill because of the robots? (of course, no one is going to lose their jobs, but will empty positions get filled?)
 - The only negative comment: one resident said, “you wouldn’t find this at a fine dining restaurant”
- Do you have any safety concerns?
 - No, very good at stopping; and following slow walking residents
 - Threshold jiggling, but since last Thursday after fixing the main one, all good
- Do you have any stories from other residents? What are they thinking/ saying?
 - *See above*
- What are some creative ways you envision using Servi outside of the dining room?
 - Serving appetizers at an event/ party
 - Drinks too?
 - Delivering packages to resident rooms
- If we were to remove these robots today, how would you feel?
 - Bummed; very bummed
 - Sad
 - Disappointed
- Anything else?
 - Staff feel much more relaxed
 - We are so fond of our servers; if the servers are happy, we are absolutely thrilled
 - Our food is warmer!
 - Would like more songs (other than Happy Birthday) 😊
 - I’ve shared this robot with many restaurants I’ve visited and they were very impressed that a senior living community had dining robots
 - I applaud you for doing this and asking us for feedback, thank you for asking us; and more importantly, thank you for having this meeting with the staff because their opinion really matters
 - “Forward-thinking” – this is SF



Notes 2. CDM Post-pilot Focus Group Discussion Notes – Staff and Residents

Bear Robotics/ FPCIW

Post- Deployment Focus Group Notes (CDM)

Staff

[Thinking about the last 2 months...]

- Describe for a few minutes your typical work shift
 - Side work to prep; all prepping takes about 30 min
 - 3 shifts: 6AM, 11:30AM, 4PM
- What is the most enjoyable part about your job?
 - The pay and benefits
 - Serving the residents
 - Being helpful for residents for employees
 - I stayed as long as I have because of the residents
- What is most difficult about your job, your top concerns?
 - Short staffed; most shifts especially during COVID – about 50% less staffed
 - The walking back and forth

[Specifically, about the robots...]

- General thoughts
 - There are times when it is helpful, but it can be so slow when you're in a hurry
 - I'm the only one who uses it for breakfast; especially for big tables it's very helpful
 - At first it was great/ helpful; first courses are great, but when they couldn't talk to each other, it got frustrating
 - They move slowly; but not TOO much of an issue because I don't want things to spill
 - It definitely helps to run food out of the kitchen
- Do you have any worries or concerns about the robots currently?
 - Good sensors so no safety concerns
 - Safety-wise we don't see anything wrong with it
 - Flooring might cause more of a mess/ be loud than being helpful
- How do you think the residents are reacting?
 - Some of them name it and are excited; they always ask where the robots are
 - I know one resident that doesn't like the sounds it makes; but most of them usually don't mind because they know it's coming
- *What are some creative ways you envision using Servi outside of the dining hall?*
- If there was something more the robots could do (a new/ different feature), what would it be?
 - Adjusting speed
 - If we could use it for bussing, it could be helpful (right now, we can't do it loud)
 - Take orders
- *Any specific feedback to the team at Bear Robotics?*
- Do you recommend these robots to other Front Porch communities?
 - As it stands right now, no; the communication/ network problems – the amount of time it takes to fix it isn't helpful
 - Yes, if they were very short staffed



- At the end of the day it does get the job done so yes, I do recommend it
- If we were to remove these robots today, how would you feel?
 - It's definitely gotten better so as of right now, I'd be bummed
 - I'd be bummed too
 - Before robots, the expo line was CRAZY and backed up and now it's not so for that reason alone it's been very helpful
 - We'd be screwed
 - It does help (reluctantly)
- Misc.
 - Do the two HAVE to talk to each other? If its causing so much problems, can't they just remain separate on the network?
 - The reason I don't like using it for bussing is because it's so loud with stacked plates
 - Walled bussing trays would be helpful and feel safe

Residents

[In the last 2 months...]

- How often did you dine in the dining room at?
 - 3 times/ day
 - Just lunch, some dinners
 - 2/3 times a week for dinners
- What do you appreciate the most of the service provided by dining staff?
 - Biggest effort to be very cordial; tries to get to know residents
 - It's so hard right now
 - Very pleasant; can tell they are pressed for time
 - Great job under difficult circumstances; goes out of their way to accommodate
- What is your favorite part about the dining experience?
 - Being with the members of our community; social aspect
 - Reservation 3 days ahead; 4 seating – reservations make it harder to come flexibly (this is due to staffing shortage)
- What is an aspect of the dining experience that can be improved, what are some of your concerns?
 - Scheduling/ reservation – can be more flexible
 - Using tech to order/ order goes to kitchen
- How is the speed of service? Is the wait for your food/drinks ever an issue/concern?
 - Pretty slow; staff-driven
 - Much better since they staggered
 - Definitely the food showed up quicker the last few months because of the robots

[Specific to the robot...]

- How do you feel about the robots supporting dining services?
 - Much cuter than I thought it was going to be
 - The most important thing is how the staff feel; if its making it harder for them then no, but doesn't bother me in any way
 - After a short period of time, it becomes part of the environment



- Originally many naysayers, the chair of committee really pushed for it; the complainers have been won over
 - We enjoy them;
 - We need more music on it
 - At first staff were worried, but now
 - I wish they could carry drinks because that is the heaviest
- Do you have any worries/ concerns regarding the dining robots currently?
 - Possibly residents or walkers getting in the way of its path, although it does really well to avoid all that
- Do you have any safety concerns?
 - *See above*
- Do you have any stories from other residents? What are they thinking/ saying?
 - *See above*
- What are some creative ways you envision using Servi outside of the dining room?
 - Can it take my dog for a walk?
 - Deliver the bagged dinners to our doors
 - Patio eating
 - Drinks
- If we were to remove these robots today, how would you feel?
 - I'd be disappointed; it'd be harder on the staff
 - I enjoy it
 - We've dressed them up and created personalities and we're having so much fun with them; I'd be disappointed
 - I feel sort of neutral about the robots because I don't eat in the dining room much
- Misc.
 - Walkers might be in the way; there is not enough staff to take care of this part
 - Suggestion: use one for bussing and one for serving
 - We totally defer to the staff; if they are pleased with it and it's helpful for them, we are on board
 - We want to thank Front Porch for doing this and asking us about our experiences. It's very much appreciated.



Flyer 1. Community engagement collateral

NEW DINING ROBOTS AT SAN FRANCISCO TOWERS!

Your dining robots will:

- **improve** your dining experience
- **support** our dining servers
- **help** with drink serving, food running and table bussing
- make it **easier** for staff to clear tables
- use sensors to navigate the dining area on it's **own**
- **reduce** number of server trips to the kitchen



San Francisco Towers
A FRONT PORCH COMMUNITY



CENTER FOR INNOVATION
AND WELLBEING



For questions about the new dining robots please
contact **Jamie Gerkowski**, Dining Services Director

For more information visit
www.bearrobotics.ai



Bear Robotics Servi Robot: Networking/ Technical specifications

Firewall

Firewall needs to open port

- outbound port 80, 443
 - related tools: Universe, Bigquery API, Telemetry etc.
 - protocols: WebRTC, Bearsocket, HTTP, and HTTPS
- outbound port 22, 5000
 - related tools: penny-ssh, penny-scp, OTA
 - protocols: SSH, HTTPS (to get port number to tunnel to each robot)

Firewall needs to allow outbound URLs

- Bearrobotics
 - *.bearrobotics.ai
- Google
 - bigquery.googleapis.com
 - 1e100.net
 - gcr.io
 - google.com

Wi-Fi

AP Specifications

- Minimum Network Security Specification: WPA2
- Wireless Network: 5 GHz 802.11ac
- No Renewing Passwords/Certificates
- Minimum Download Speed: 1.5MB/s

Multirobot Network Requirements

Things to check with IT when using customer network:

- Ensure that device/AP isolation is not turned on
 - This will block communication between robots on the network
- Ensure that broadcasting messages is not blocked on the network
 - This is how our robots discover each other

Visit the Bear Robotics [Customer Resource](#) page for more information.